

**SAMPLING PLAN RESULTS
AND
PROPOSED REMEDIATION PLAN**

MAY 1987

**C & F REALTY
MITIGATION/DEVELOPMENT PLAN**

CARLSTADT, NEW JERSEY SITE

ACOE, Application/Public Notice #12672-86-773-J1



**67A MOUNTAIN BOULEVARD EXTENSION
P.O. BOX 4038
WARREN, NEW JERSEY 07060**

SAMPLING PLAN RESULTS
AND
PROPOSED REMEDIATION PLAN

C&F REALTY, LTD.
CARLSTADT, NEW JERSEY
#0448-0017-04

Prepared by:

PAULUS, SOKOLOWSKI &
SARTOR, INC.

May 7, 1987

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1.0 SUMMARY AND CONCLUSIONS

C&F Realty Ltd (C&F) is the owner of property, located in the Borough of Carlstadt and under the jurisdiction of the Hackensack Meadowlands Development Commission (HMDC), a state planning and zoning agency. Proceeding on the basis of guidance from HMDC that the Army Corps of Engineers (ACOE) had no jurisdiction over their property, C&F began the development and filling of wetlands for a series of office/warehouse buildings. On August 1, 1985, the ACOE issued a stop-work order and advised C&F that an ACOE permit was required under Section 404 of Federal Clean Water Act. Shortly thereafter, C&F retained Paulus, Sokolowski & Sartor (PS&S) to act as their agents in the filing of the ACOE Permit Application.

The ACOE accepted the C&F application and wetland mitigation plan as complete for filing and issued a Public Notice of the application on May 27, 1986. In response to the Public Notice, the United States Environmental Protection Agency (USEPA), one of the federal reviewers of ACOE Permit Applications, commented on the potential mercury and arsenic contamination levels in the C&F site soils, in view of the known problems of mercury contamination in the local area, and they requested that additional sampling be conducted in specific project areas to be excavated and disturbed.

In response, PS&S prepared and submitted to the USEPA a plan for the requested additional sampling of site soils. After this plan was approved by the USEPA, PS&S acquired the additional samples on February 24 thru 26, 1987.

The results of these new samples, received in March and April 1987, revealed the presence of significant concentrations of arsenic and mercury within the site soils, up to depths of two to three feet. At a few spots within the mitigation areas, significant concentrations were found at depths of 3 to 4 feet. Additional leachate testing, however, determined that arsenic and mercury were bound up within the soils and that the arsenic and mercury, contained within these soils, has had a minor impact upon the existing environment.

Since the site soils were found to contain significant arsenic and mercury concentrations, a review of the activities that would disturb the site was completed. A remediation plan to control the movement, handling and proper disposal of site soils has been prepared and is part of this submission.

how much to be excavated?

As part of the remediation plan for the project site, excavated soils from building sites and the mitigation sites will be stockpiled on a part of the project, Block 84, Lot 4H. Prior to the placement of soils, a berm encircling Lot 4H would be constructed and a synthetic liner would be loosely laid over the ground surface and berm. With this configuration, it is estimated that 33,000 cubic yards could be stored in the lined area. As materials are generated by excavation, they would be piled onto the lined area and, at the end of each day, covered by a temporary synthetic sheet covering.

Stockpiled soils would be disposed in a local landfill, as a permitted non-hazardous waste material once a waste classification letter is issued by NJDEP. In the event that all local landfills have reached their design capacity during the Summer of 1987, stockpiled soils would remain in place until an alternative landfill is available. Since the soils will be stored in a lined area with a capacity equal to the estimated volume of excavated soils, no adverse impacts on the project site are anticipated. The longer period of stockpiling would actually produce drier, more transportable soils.

Soil?

As an additional remediation measure at the building sites, the backfilling of excavations would be completed as soon as possible and temporary coverings would be used for excavations. A minimum of two feet of clean fill will be used to cap excavations in parking areas and for utility cuts. Geomembranes (impervious liners) and geotextiles (filter fabrics) would be considered as alternates to excavations and capping.

Specific remediation measures will also be implemented during the construction of the mitigation areas. All excavations in the mitiga-

how many?

tion areas will be performed behind silt curtains or fences, without the introduction of water flows. In order to insure that significant concentrations of arsenic and mercury are removed, deeper excavations will be completed at a number of locations within the mitigation areas. Upon completion, these spot excavations will be capped with a minimum of one foot of clean fill, obtained from uncontaminated off-site sources. Thus, any potential adverse impacts from arsenic and mercury to the mitigation areas will be avoided by the proposed remediation plan.

to whom?
not to me!!

In summary, the excavation, stockpiling, testing, capping and off-site disposal methods provided within the proposed remediation plan demonstrate that site soils can be safely handled. Protection of the environment, implementation of a mitigation plan and development of the project site for the land uses proposed by C&F can occur together in a coordinated plan and this plan will successfully eliminate the existing minimal impacts posed by the presence of mercury and arsenic at the project site.

quite sure of themselves.

2.0 DESCRIPTION OF SITE AND ENVIRONS

2.1 Site Location

The C&F Realty site is located at the terminus of 16th Street in the Borough of Carlstadt, Bergen County, New Jersey (See Figure 1). In accordance with the Tax Map of the Borough of Carlstadt, the project site is identified as Lots 3, and 4A thru 4J in Block 84 and it occupies a total area of 30.3 acres.

Although it is generally described as the C&F Realty site, three other owners are part of the project site: Richard F. Harries, Inc., JASG Realty and SSANGYONG (U.S.A.), Inc. (See Figure 2). C&F has been authorized, in writing, to act on behalf of these three owners.

2.2 Zoning

The project site is located within the jurisdiction of the Hackensack Meadowlands Development Commission (HMDC), a NJ State Planning and Zoning Agency. HMDC, whose zoning authority supercedes the Carlstadt zoning ordinance, has zoned the C&F Realty site as Light Industrial and Distribution "B" (See Figure 3). This designation permits the construction of various medium intensity industrial uses (See N.J.A.C. 19:4-4.94 & 4.95). The HMDC Zoning Regulations impose the requirement of a 50 foot wetland buffer strip along the Site's border of Berrys Creek in which no development or filling is permitted.

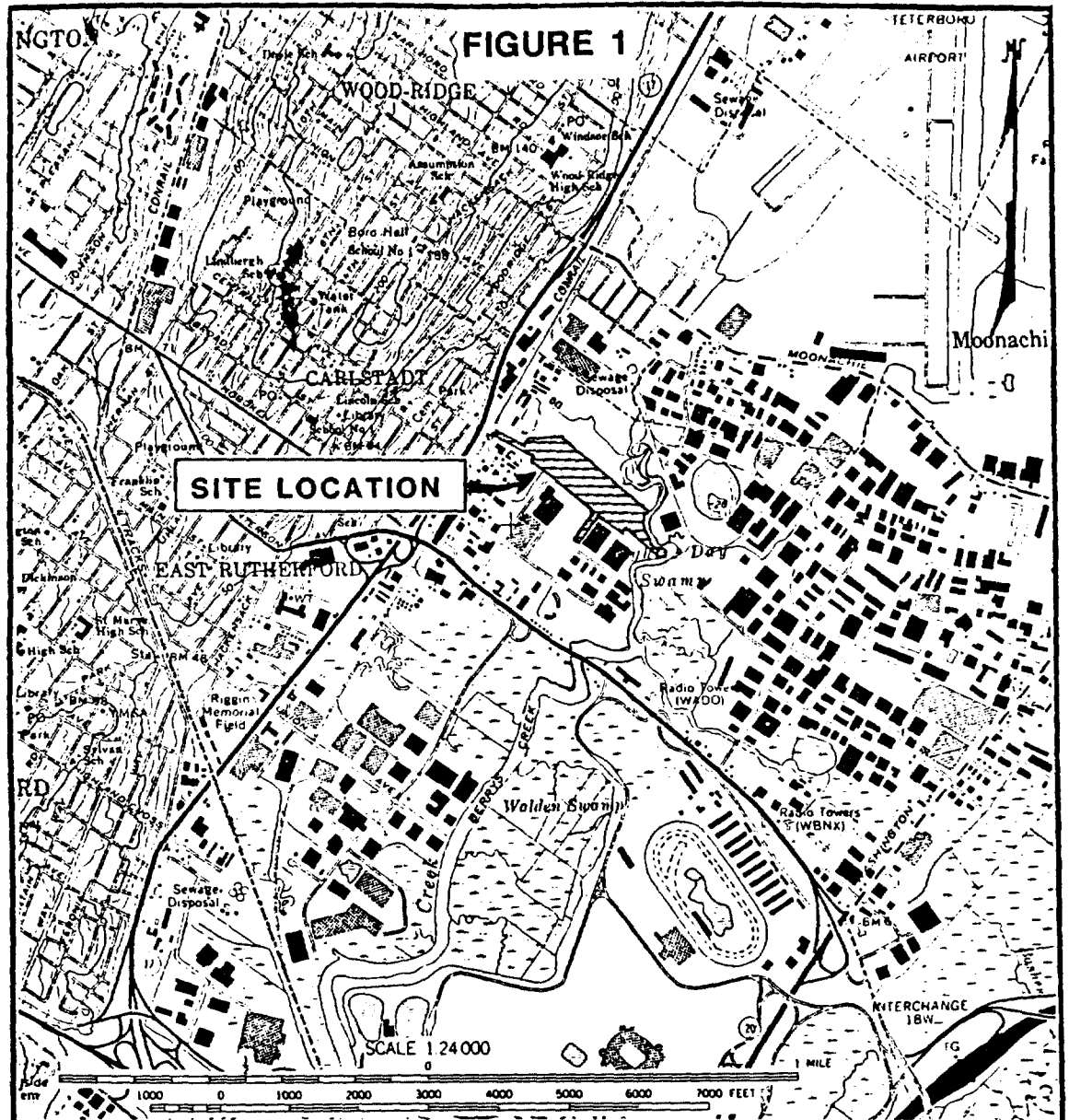
2.3 Site Description

The project site immediately abuts Berrys Creek on the east, a major tidal tributary of the Hackensack River. Never Touch Creek, one of the many minor tidal tributaries of Berrys Creek, bisects the project site and also dead-ends within the project site.

The existing conditions at the project site are a mixture of natural and man-made. Lots 4B and 4D are fully developed parcels lying in the westerly portion of the project site. In addition, a

total of 13.1 acres of the project site has been filled, encompassing all of Lots 4A and 4C and portions of Lots 3 and 4E thru 4J. The remainder of the site essentially contains low quality wetland, vegetated by Phragmites, and a portion of Never Touch Creek.

Although both Berrys Creek and Never Touch Creek are tidally flowed, a combination of hydraulic restrictions, natural and man-made, has limited tidal action on the project site. Salinity, a key indicator of tidal flow, decreases markedly in Berrys Creek, upstream of the confluence with the Hackensack River. Recent salinity readings made by the HMDC indicate an average of approximately 2 parts per thousand (ppt) in the vicinity of the project site. For comparison, wetlands in the Hackensack Meadowlands, with stronger tidal flush, have salinities greater 6 ppt.



SOURCE:

U.S.G.S. TOPOGRAPHIC MAP
7.5 MINUTE SERIES
WEEHAWKEN, N.J. QUAD.
DATUM: NGVU
ADJACENT PROPERTY OWNERS:
DIAMOND-SHAMROCK CHEM. CO
ARSYNCO INC.
GEORGE ABAD, T/A
KNICKERBOCKER ASSOC.
40 BROAD STREET ASSOC.
NEW M.P.I. CORP.
MORRIS PARK AVE. CORP.

VICINITY MAP

C & F REALTY

WATERFRONT DEVELOPMENT PERMIT

Borough of Carlstadt Bergen County, N.J.
Block 84 Lots 3, & 4A-4J

PAULUS, SOKOLOWSKI & SARTOR

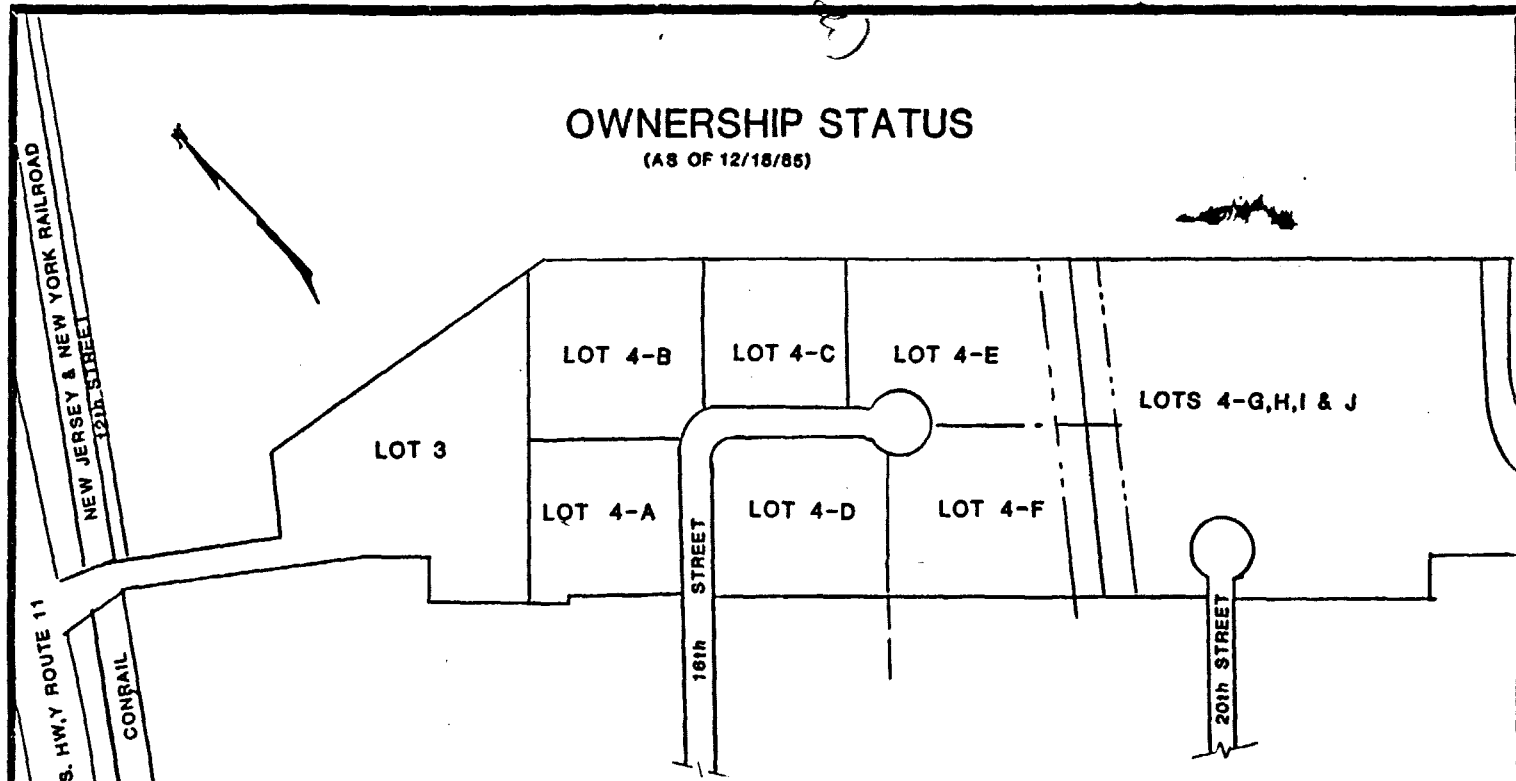
CONSULTING ENGINEERS

Warren, New Jersey

Drn. By: M.R.	Scale: As shown	Proj. No: 448-017
Ck'd By: S.O.	Date: 10/88	Sheet No. 1

OWNERSHIP STATUS

(AS OF 12/18/85)



BLOCK 84

LOT	OWNERSHIP STATUS
3	OWNED BY C & F REALTY
4-A	SOLD TO RICHARD F. HARRIES ON 12/4/84
4-B	SOLD TO JASG REALTY ON 11/20/84
4-C	OWNED BY C & F REALTY
4-D	SOLD TO SSANGYONG ON 4/4/85
4-E	OWNED BY C & F REALTY
4-F	OWNED BY C & F REALTY
4-G, H, I & J	OWNED BY C & F REALTY

C & F REALTY
MITIGATION / DEVELOPMENT PLAN
Borough of Carlstadt Bergen County, N.J.

PAULUS, SOKOLOWSKI & SARTOR
CONSULTING ENGINEERS
Warren, New Jersey

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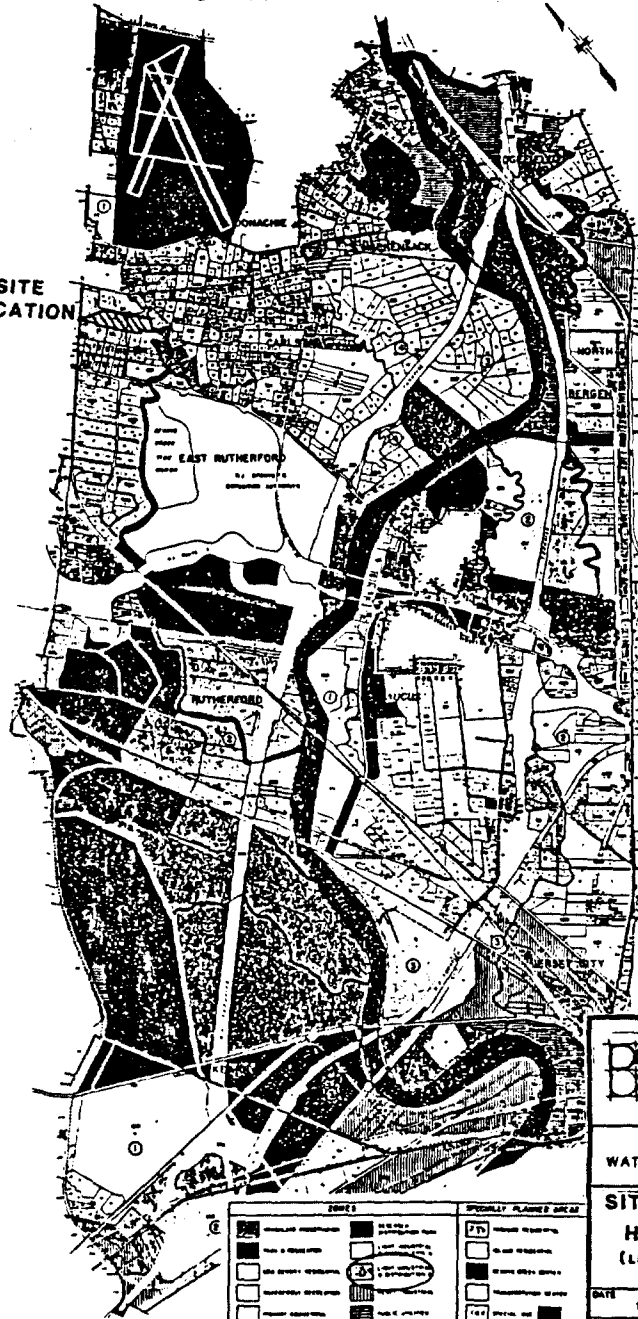
FIGURE 2

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FIGURE 3

HACKENSACK MEADOWLANDS DISTRICT OFFICIAL ZONING MAP

SITE
LOCATION



unless!!

<p>PAULUS SOKOLOWSKI and SARTOR INC. CONSULTING ENGINEERS</p>	
<p>C & F REALTY WATERFRONT DEVELOPMENT PERMIT</p>	
<p>SITE LOCATION & HMDC ZONING (LIGHT INDUSTRIAL & DISTRIBUTION D)</p>	
DATE 10/88	JOB NO. 446-017
<p>SCALE 1" = 100'</p>	
<p>SHEET NO. 2</p>	

ZONING		SPECIALLY PLANNED AREA	
	Zone D-1		Specially Planned Area 1
	Zone D-2		Specially Planned Area 2
	Zone D-3		Specially Planned Area 3
	Zone D-4		Specially Planned Area 4
	Zone D-5		Specially Planned Area 5
	Zone D-6		Specially Planned Area 6
	Zone D-7		Specially Planned Area 7
	Zone D-8		Specially Planned Area 8
	Zone D-9		Specially Planned Area 9
	Zone D-10		Specially Planned Area 10

who can you find this

3.0 MERCURY CONTAMINATION IN THE BERRYS CREEK BASIN

3.1 Identification of the Problem

Public attention to mercury contamination in the Hackensack Meadowlands first arose during 1972 when high concentrations were found in Berrys Creek tidal marsh, also known locally as Walden Swamp, adjacent to the New Jersey Sports Complex (Figure 4). In a study for the environmental impact assessment of the then proposed Sports Complex, unusually high concentrations of mercury were found in marsh and channel sediments. Repeated measurements within Berrys Creek tidal marsh in 1974 confirmed the 1972 data and indicated a long term accumulation of mercury in the marsh sediments and the channels of the tidal marsh.

Although the degree of contamination was observed to have spatial variations within the Walden Swamp, the heaviest contamination was observed in the upper six inches, with significant contamination extending to a depth of at least 36 inches. Concentrations of mercury ranged from 0.3 to 208 parts per million (ppm) in the upper six inches, and from 5.5 to 14.6 ppm at depths from 30 to 36 inches.

Uncontaminated sediments generally contain concentrations less than 0.15 ppm. In a survey of tidal marshes from South Carolina to Florida by Windom (1976), the average concentration of mercury in sediment cores, collected at 25 locations was found to be 0.07 ppm. In a separate study of North Atlantic estuarine sediments, Aston (et al) found a mean mercury value of 0.41 ppm. Sediment concentrations exceeding 1.0 ppm are considered to be contaminated from industrial sources or natural deposits.

3.2 Additional Studies

Subsequent to the initial identification during 1972 to 1974, NJDEP, thru a grant issued by the former Office of Cancer and Toxic Substances, retained the Environmental Research Laboratory of the HMDC

[illegible]

to study the mercury problem in greater detail. Over an extended period ending in 1980, HMDC acquired and analyzed numerous samples of marsh soils, channel sediments and surface water, both in and outside of the Berrys Creek Basin in order to ascertain the movement of mercury into the biotic and abiotic ecosystem of the Hackensack River Estuary.

Mercury concentrations in marsh soils ranged from 0.1 ppm to 2006 ppm and from 0.1 ppm to 1730 ppm in the channel sediments. The greatest concentrations were observed in Berrys Creek sediments. The greatest marsh sediment concentrations observed outside of the Berrys Creek drainage basin were 158 ppm, in Penhorn Creek and 54 ppm in Cromakill Creek. The greatest concentrations of mercury in channel sediments outside of the Berrys Creek drainage basin were 97 ppm in Penhorn Creek and 33 ppm in Bellman's Creek.

The mean values of mercury in the categorized groups of marsh sub-stations suggests that marshes closer to the Hackensack River are more contaminated than those further removed from the river. This was observed in every sample interval in both upstream and downstream groups. The greater contamination of marsh sediments occurs in the mid to upper strata observed. The sediments closer to the surface (0-2 inches) of the marshes along Berrys Creek and in tidal marshes along the river upstream from Berrys Creek are less contaminated than those in the 2-4 and 4-6 inch range. This pattern is also observed in the sediments of marshes downstream from Berrys Creek and further from the river. Those downstream marshes closer to the river, however, appear to have greater contamination of mercury in the upper strata sediments.

3.3 NJDEP Enforcement Activities

Following the HMDC's review of the pattern of contamination was NJDEP investigation into the source(s) of the mercury contamination. NJDEP's investigation led to the initiation of enforcement actions, and later litigation, against a former chemical company located at the

headwaters of Berrys Creek. This company, known as Wood-Ridge Chemical, Ventron or Velsicol, was accused by NJDEP as being the source of the mercury discharges over a 40 year period.

After prolonged litigation, the successor company, Velsicol Chemical, was determined to be responsible for the mercury contamination found in the Berrys Creek Basin. The courts further determined that Velsicol was financially liable for the full cost of cleanup, both on its former plant site and throughout the Berrys Creek Basin. Velsicol was directed by the court to undertake the necessary studies, leading to the submission of a cleanup plan for the approval of NJDEP.

Subsequently, NJDEP formed an interagency group of federal, state and company representatives to conduct an on-going review of Velsicol's work progress, known as the Technical Advisory Group (TAG). To date, TAG has been overseeing the preparation of cleanup options and environmental data, by Velsicol and its consultant, ERM Southwest.

4.0 DESCRIPTION OF U.S.E.P.A. APPROVED SAMPLING PLAN

In the course of their review of the C&F application to the ACOE (Application #12672-86-773-J1), the United States Environmental Protection Agency (USEPA) expressed reservations about the potential impacts of the project, in view of the "high level" of mercury contamination found in the Berrys Creek Basin (see Section 3.0 herein for a detailed review). USEPA questioned the soil sampling data for mercury and arsenic contamination previously submitted with the C&F application, as not being representative of the areas to be disturbed and excavated for the project. They requested that sediment samples be taken in a manner representing the complete spatial and vertical profile of sediments from the site which are proposed to be excavated and that analyses of those individual sample points and strata include bulk sediment levels of mercury and arsenic.

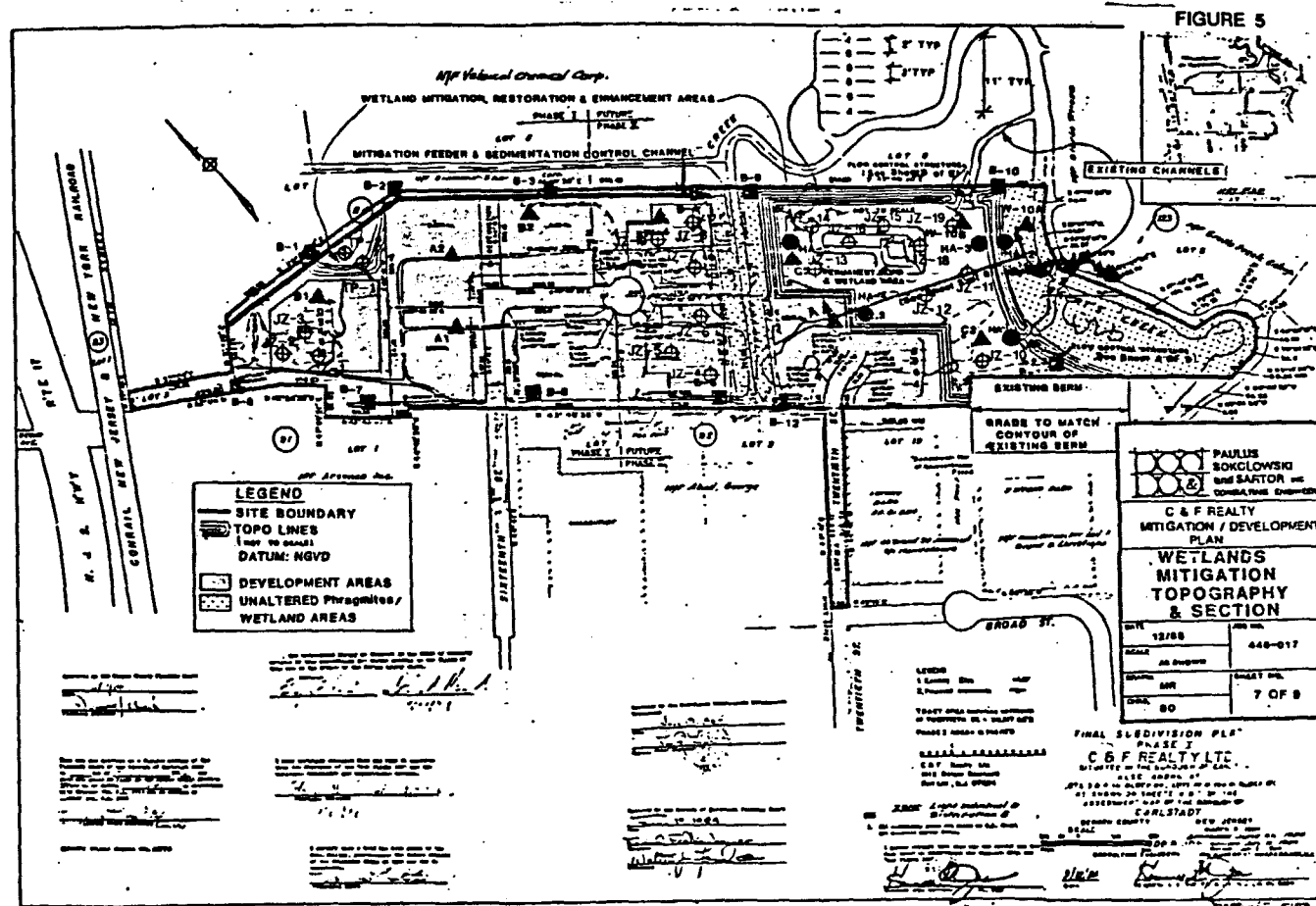
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In response, PS&S, on behalf of C&F Realty, prepared a soil sampling plan for the requested additional sampling and determination of arsenic and mercury contamination. After a series of meetings in December 1986, the USEPA approved the proposed sampling plan on December 24, 1986.

As shown in Figure 5, twenty-one sample locations were distributed throughout the project site to provide a representative picture of arsenic and mercury contamination within site areas that will be excavated or disturbed. At each of the sample locations, multiple soil samples were acquired. In accordance with the request of USEPA, the ACOE Waterway Experiment Station (WES) was contacted to obtain the most appropriate sampling and analysis procedures for the project site. Following the recommendations of WES, one foot individual/discrete soil samples were completed at each location, until a depth of one foot below the intended final grade, after proposed site development, is reached. For example, if a final grade of three feet below existing elevation is proposed, 4 one-foot individual/discrete samples would be completed. Thus, this technique

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would provide assurances that the final grades would not expose "unacceptable levels" of arsenic and mercury contamination and that exposure of final grades would not cause adverse environmental impacts.

In accordance with the recommendations from WES, PS&S began the acquisition of soil samples at the 21 locations on February 24, 1987. Qualified geologists from PS&S acquired soil samples at each location by using a hand auger. All samples were visually classified, in accordance with the Unified Soil Classification System, and soil logs were prepared. All sampling was conducted, using strict quality assurance/quality control procedures (see Attachment 1). At the end of each day of sampling, samples were transported to Garden State Laboratories, an NJDEP licensed laboratory (License #07044) for chemical analysis, under chain-of-custody documentation (see Attachment 2).

Two types of laboratory analyses recommended by WES were performed. First, the dry weight (bulk) concentration of arsenic and mercury (mg/kg) in the soil matrix was determined in accordance with USEPA Manual 600/4-79-020 and the WES report, "Procedures for Handling and Chemical Analyses of Sediment and Water Samples", May 1981. Second, the concentration of arsenic and mercury (in mg/l) that could leach from the soil matrices was also determined in accordance with USEPA extraction procedures (SW-846, 2nd edition). The bulk concentrations would be used to identify areas on the project where significant levels of arsenic and mercury were present. The leachate concentrations would be used to identify the mobility of arsenic and mercury within the in-situ soils and the potential off-site disposal site for any excavated in-situ soils. Evaluated together, bulk and leachate concentrations would be used to determine the need for remediation.

5.0 DISCUSSION OF RESULTS OF THE 2/24/87 SAMPLING PLAN

5.1 Bulk Sampling

Preliminary laboratory results of the bulk sampling were received by PS&S by telephone on March 5, 1987. After tabulating these results, an initial review of the data for reproducibility was performed. Based upon this review, the laboratory was requested to recheck all results and to rerun 29 of the 79 original samples.

All of the preliminary results were then compared to USEPA and TAG criteria for "acceptable levels" of arsenic and mercury in soils. USEPA has informally identified a criterion of 10 mg/kg (personal communication, D. Suszkowski, USEPA) while TAG has informally identified a higher level of 20 mg/kg (personal communication, Paul Galluzzi, HMDC), reflective of the high ambient levels found in the Berrys Creek Basin. As shown on Table 5-1, all contraventions of 10 or 20 mg/kg criterions were identified. The laboratory was then instructed to complete leachate analyses on all bulk samples in contravention of 10 or 20 mg/kg criteria. This method was used to reduce sample costs and to target problem areas.

Final laboratory results of the bulk samples were received on March 12, 1987. A laboratory recheck of the preliminary results confirmed the final data. Although the retest results received on April 10, 1987 varied somewhat from the final laboratory results, all samples, previously determined to contravene the USEPA or TAG criteria, continued to contravene these criteria.

As a general rule, all of the twenty-one sample locations had either arsenic or mercury bulk concentrations exceeding USEPA and/or TAG criteria to a depth of two feet. The only exception is at sample location CF-16 (at the westerly end of the mitigation area) where contraventions to a depth of only one foot were noted. Additionally, there appears to be only a small difference between the use of the 10 or 20 mg/kg criteria for the determination of in-situ contamination.

As shown in Table 5-2, approximately 39,000 cubic yards of contaminated soils were found using the 20 mg/kg criteria, while approximately 43,000 cubic yards was found using the 10 mg/kg criteria; a difference of 10%.

5.2 Leachate Results

Leachate sample results were received on April 7, 1987. A comparison of the results with the criteria listed in USEPA Regulation 40 CFR Part 261.24 was completed (see Table 5-3). This regulation identifies a hazardous waste as having a leachate concentration greater than 5.0 mg/l of Arsenic or .2 mg/l of Mercury. When these criteria were compared to the 4/7/87 leachate results, no contraventions of the USEPA Regulation were determined. The highest arsenic concentration of .138 mg/l at CF-3 (in the most westerly area of the project site) is approximately 3% of the maximum permissible concentration of 5 mg/l. None of the mercury concentrations were found above .001 mg/l, barely above the method detection limit. Overall, the leachate results indicate that arsenic and mercury are not chemically mobile within the project site's soils.

5.3 Mitigation Area Results

Since a key part of the C&F application involves the implementation of a wetlands mitigation plan, an additional review of the both bulk and leachate results for sample sites within the two mitigation areas was performed. For the larger mitigation area, results from sample sites CF-10 thru CF-19 were reviewed, while sites CFT-1 and CFT-2 were reviewed in the smaller mitigation area. (See Figure 5 for location of the mitigation areas).

Bulk sample results for arsenic, at a depth of one foot below final proposed grades, were generally lower than bulk mercury results at the same sample sites. In the larger mitigation area, an average of the results for arsenic at the ten sample sites produced a value of 9.2 mg/kg while mercury results averaged 58.3 mg/kg. In the smaller

mitigation area, arsenic results averaged of 9.43 mg/kg while mercury results averaged 34.4 mg/kg. Overall, bulk sample results indicated the presence of bulk mercury concentrations above the USEPA criteria, one foot below the proposed final grades.

Leachate sample results for both arsenic and mercury were significantly below the limits listed in USEPA Regulation 40 CFR Part 261.64. The highest arsenic concentration of .035 mg/l was found in the 0 to 1 foot sample at sample location CF-16. For comparison, the USEPA limit is 5.0 mg/l. Mercury concentrations at all sample sites and depths were less than .001 mg/l or approximately .5% of the maximum permissionable concentration of .2 mg/l. It can be concluded, therefore, that appreciable quantities of leachates are not being generated by soils within the mitigation areas.

5.4 Conclusions

Evaluated together, the bulk and leachate test results lead to five general conclusions about the project site:

1. Although significant volumes of contaminants are present in in-situ soils, these contaminants are not chemically mobile and have a small impact on the existing environment.
2. Disturbance of the project site for site development activities is not expected to release appreciable quantities of arsenic and mercury leachates.
3. Since bulk concentrations exceed the USEPA and TAG criteria, excavated soil volumes must be properly disposed, in accordance with State and Federal Regulations.
4. If off-site disposal is chosen as an option for excavated soil volumes, leachate results indicate that excavated soils can be disposed at a disposal facility licensed to accept non-hazardous wastes.
5. Although the soils in the mitigation sites are not expected to release unacceptable quantities of leachates, at a depth of one foot below proposed final grades, additional excavations may be required to mitigate the presence of significant bulk concentrations in some areas.

*
1st time this
is addressed !!
how do we determine
where significant bulk
concentrations are ... ?

TABLE 5-1

COMPARISON OF BULK SAMPLE RESULTS¹ WITH USEPA AND TAG CRITERIA

<u>SAMPLE SITE</u>	<u>SAMPLE #</u>	<u>BULK CONCENTRATIONS (MG/KG)</u>		<u>CRITERIA CONTRAVENTIONS³</u>	
		<u>AS²</u>	<u>HG²</u>	<u>USEPA⁴</u>	<u>TAG⁴</u>
CF-1	S1	54.7	548	X	
	S2	11.6	28.7	X	
	S3	2.95	<4.5		
	S4	.85	<2		
CF-2	S1	29.6	198	X	
	S2	1.78	11.2		X
	S3	45.4	122	X	
	S4	1.91	<1.5		
CF-3	S1	22.9	377	X	
	S2	21.5	19.2	X	
	S3	2.83	<7.5		
	S4	1.08	<2		
CFT-1	S1	17.7	439	X	
	S2	11.8	15.3	X	
	S3	2.14	<2		
	S4	12.9	61.3	X	
CFT-2	S1	20.7	78.6	X	
	S2	48.4	422	X	
	S3	6.40	22	X	
	S4	5.96	7.6		
CF-6	S1	11.4	110	X	
	S2	19.5	36.4	X	
	S3	14.3	8.2	X	
	S4	2.05	2.05		

<u>SAMPLE SITE</u>	<u>SAMPLE #</u>	<u>BULK CONCENTRATIONS (MG/KG)</u>		<u>CRITERIA CONTRAVENTIONS³</u>	
		<u>AS²</u>	<u>HG²</u>	<u>USEPA⁴</u>	<u>TAG⁴</u>
CF-8	S1	9.11	20.7	X	
	S2	25.8	41.6	X	
	S3	34.9	27.8	X	
	S4	7.56	16.3	X	
CF-10	S1	34	27.7	X	
	S2	4.38	<11	X	
	S3	12.1	86.9	X	
CF-11	S1	9.25	75	X	
	S2	26.0	18.4	X	
	S3	24.2	18.0	X	
CF-12	S1	17.0	65.6	X	
	S2	13.7	10.3	X	
	S3	16.6	54.9	X	
CF-14	S1	48.0	457	X	
	S2	10.2	112	X	
	S3	1.31	<2		
CF-17	S1	63.1	219	X	
	S2	38.5	60.5	X	
	S3	10.2	14.0	X	
CF-18	S1	18.7	<6.5	X	
	S2	7.01	<7.5		
	S3	23.4	<10	X	
	S4	7.42	8.59		
	S5	.88	<2		
CF-19	S1	24.1	346	X	
	S2	7.39	21.7	X	
	S3	4.40	33.2		

<u>SAMPLE SITE</u>	<u>SAMPLE#</u>	<u>BULK CONCENTRATIONS (MG/KG)</u>		<u>CRITERIA CONTRAVENTIONS³</u>	
		<u>AS²</u>	<u>HG²</u>	<u>USEPA⁴</u>	<u>TAG⁴</u>
CF-7	S1	19.1	42.5	X	
	S2	9.6	85.2		X
	S3	2.91	<8		
CF-13	S1	40.3	348	X	
	S2	46.7	138	X	
	S3	5.26	<7.5		
CF-16	S1	19.6	38.2	X	
	S2	.91	<8		
	S3	8.14	<10		
	S4	2.06	<7.5		
	S5	.43	<1.5		
CF-15	S1	12.8	44.8	X	
	S2	5.58	30.5	X	
	S3	17.3	363	X	
CF-5	S1	130	360	X	
	S2	24.4	134	X	
	S3	17.2	13.4	X	
	S4	4.53	13.7	X	
CF-4	S1	23.7	26.1	X	
	S2	52.1	449	X	
	S3	29.5	76.5	X	
	S4	3.6	10.5		
CF-9	S1	36.2	769	X	
	S2	23.7	7.93	X	
	S3	20.4	<5	X	
	S4	21.4	4.51	X	

NOTES

1. Source of Data is Garden State Laboratories, Inc. Report of March 12, 1987. Samples were taken on February 24 thru February 26, 1987.
2. As = Arsenic; Hg = Mercury
3. Where one pollutant contravened either the USEPA or TAG criteria at a particular sample number, it was assumed that the entire sample number was in contravention.
4. USEPA = 10 mg/Kg; TAG = 20 mg/Kg.
5. Field blanks of each day of sampling had the following test results:
As, < .001; Hg < .01.

TABLE 5-2

ESTIMATE OF CONTAMINATED SOIL VOLUMES

<u>SAMPLE SITE</u> ¹	<u>Contamination Depths (ft)</u>		<u>Influence Area</u> ⁵	<u>Contamination Volumes (cf)</u>	
	<u>10mg/Kg</u> ²	<u>20mg/Kg</u> ³		<u>10mg/Kg</u>	<u>20mg/Kg</u>
CF-1	2	2	6,600 SF	13,200	13,200
CF-2	3	3	15,000	45,000	45,000
CF-3	2	2	3,300	6,600	6,000
CF-4	3	3	25,600	76,800	76,800
CF-5	4	2	22,000	88,000	44,000
CF-6	3	2	20,100	60,300	40,200
CF-7	2	2	22,100	44,200	44,200
CF-8	4	3	22,500	90,000	67,500
CF-9	4	4	29,700	118,800	118,800
CF-10	3	3	29,100	87,300	87,300
CF-11	3	3	25,500	76,500	76,500
CF-12	3	3	23,000	69,000	69,000
CF-13	2	2	17,000	34,000	34,000
CF-14	2	2	21,000	42,000	42,000
CF-15	3	3	20,000	60,000	60,000
CF-16	1	1	12,500	12,500	12,500
CF-17	3	2	24,000	72,000	48,000
CF-18	3	3	20,000	60,000	60,000
CF-19	3	3	22,500	67,500	67,500
CFT-1	4	4	6,600	26,400	26,400
CFT-2	3	3	6,600	19,800	19,800
<u>TOTALS</u>			394,700 SF (9.06 acres)	1,169,900 (43,330 CY)	1,059,300 (39,230 CY)

NOTES:

1. In accordance with the USEPA approval and the recommendations of WES, soil sampling at 21 locations (see Location Plan) on the C&F Realty, Carlstadt site was performed by PS&S on February 24 thru 26, 1987. Soil samples, acquired in this program, were analyzed for the presence of arsenic and mercury, by both bulk (USEPA Manual 600/4-79-020) and EP extraction procedures (USEPA Method SW846, 2nd Edition).
2. USEPA has informally identified a criterion of 10 mg/Kg, as determined by bulk testing procedures, for the identification of "acceptable" levels of either arsenic or mercury in soils (personal communication, D. Suszkowski, USEPA).
3. The Interagency Technical Advisory Group (TAG) on the remediation of mercury contamination in the Berry's Creek Basin has informally identified 20 mg/Kg as an indication of "acceptable" levels of either arsenic or mercury, reflective of the high ambient levels found in the Berry's Creek Basin (personal communication, P. Galluzzi, HMDC).
4. After reviewing the results of bulk testing, completed on the 2/24/87 soil samples, the lowest depth at which mercury and arsenic concentrations contravened the USEPA and TAG criterions was determined for each sample location. The depth that is shown is the deeper of the arsenic or mercury contraventions.
5. The distribution of contamination associated with the 21 soil sampling locations was estimated by a graphical technique known as the Theissen method. In this method, polygons are constructed around each sample location by drawing radial lines from each location to an adjacent location and then constructing perpendicular lines thru the midpoints of the radial lines, with polygons formed from the intersections of perpendicular lines. The area within each of the polygons was calculated and is tabulated for each sample location. This area represents the zone of influence of each sample location.
6. The contamination volume for the USEPA and TAG criterions is computed for each sample location area by multiplying the appropriate depth and the influence area.

TABLE 5-3

COMPARISON OF LEACHATE RESULTS WITH USEPA REGULATIONS

SAMPLE LOCATION	SAMPLE #	E.P. TOXICITY RESULTS ARE IN MG/L		COMPLIES	
		ARSENIC	MERCURY	YES	NO
CF-1	S-1 0-1'	0.044	<0.001	X	
CF-1	S-2 1-2'	0.034	<0.001	X	
CF-2	S-1 0-1'	0.017	<0.001	X	
CF-2	S-2 1-2'	0.022	<0.001	X	
CF-2	S-3 2-2.75'	0.047	<0.001	X	
CF-3	S-1 0-1'	0.008	<0.001	X	
CF-3	S-2 1-2'	0.138	<0.001	X	
CFT-1	S-1 0-1'	0.012	<0.001	X	
CFT-1	S-2 1-2'	0.034	<0.001	X	
CFT-2	S-1 0-1'	<0.001	<0.001	X	
CFT-2	S-2 1-2'	0.002	<0.001	X	
CFT-2	S-3 2-2.75'	0.001	<0.001	X	
CF-6	S-1 0-1'	0.004	<0.001	X	
CF-6	S-2 1-2'	0.050	<0.001	X	
CF-7	S-1 0-1'	0.004	<0.001	X	
CF-7	S-2 1-2'	0.023	<0.001	X	
CFT-1	S-4 3-4'	-----	-----	X	
CF-13	S-1 0-1'	0.006	<0.001	X	
CF-13	S-2 1-2'	0.013	<0.001	X	
CF-16	S-1 0-1'	0.035	<0.001	X	
CF-16	S-2 1-2'	0.006	<0.001	X	
CF-15	S-1 0-1'	0.006	<0.001	X	
CF-15	S-2 1-2'	0.027	<0.001	X	

<u>SAMPLE LOCATION</u>	<u>SAMPLE #</u>	<u>E.P. TOXICITY RESULTS ARE IN MG/L</u>		<u>COMPLIES*</u>	
		<u>ARSENIC</u>	<u>MERCURY</u>	<u>YES</u>	<u>NO</u>
CF-15	S-3 2-3'	0.023	<0.001	X	
CF-5	S-1 0-1'	0.029	<0.001	X	
CF-5	S-2 1-2'	0.019	<0.001	X	
CF-5	S-3 2-3'	0.010	<0.001	X	
CF-4	S-1 0-1'	0.010	<0.001	X	
CF-4	S-2 1-2'	0.027	<0.001	X	
CF-4	S-3 2-3'	0.034	<0.001	X	
CF-9	S-1 0-1'	0.025	<0.001	X	
CF-9	S-2 1-2'	0.020	<0.001	X	
CF-9	S-3 2-3'	0.008	<0.001	X	
CF-9	S-4 3.0-3.5'	0.016	<0.001	X	
CF-8	S-1 0-1'	0.005	<0.001	X	
CF-8	S-2 1-2'	0.026	<0.001	X	
CF-8	S-3 2-3'	0.025	<0.001	X	
CF-10	S-1 0-1'	0.010	<0.001	X	
CF-10	S-2 1-2'	0.007	<0.001	X	
CF-10	S-3 2-3'	0.013	<0.001	X	
CF-11	S-1 0-1'	0.008	0.001	X	
CF-11	S-2 1-2'	0.064	<0.001	X	
CF-11	S-3 2-3'	0.008	<0.001	X	
CF-12	S-1 0-1'	0.016	<0.001	X	
CF-12	S-2 1-2'	0.010	<0.001	X	
CF-12	S-3 2-3'	0.010	<0.001	X	
CF-14	S-1 0-1'	0.039	<0.001	X	

<u>SAMPLE LOCATION</u>	<u>SAMPLE #</u>	<u>E.P. TOXICITY RESULTS ARE IN MG/L</u>		<u>COMPLIES*</u>	
		<u>ARSENIC</u>	<u>MERCURY</u>	<u>YES</u>	<u>NO</u>
CF-14	S-2 1-2'	0.008	<0.001	X	
CF-17	S-1 0-1'	0.030	<0.001	X	
CF-17	S-2 1-2'	0.011	<0.001	X	
CF-18	S-1 0-1'	0.022	<0.001	X	
CF-18	S-2 1-2'	0.010	<0.001	X	
CF-19	S-1 0-1'	0.008	<0.001	X	
CF-19	S-2 1-2'	0.011	<0.001	X	
CF-19	S-3 2-3'	0.011	<0.001	X	

NOTES:

1. Source of data is the Garden State Laboratories, Inc. report of April 7, 1987.
2. * = the results for arsenic and mercury leachate are less than the USEPA standards of 5.0 mg/l of arsenic and .2 mg/l of mercury listed in 40 CFR Part 261.24.

6.0 DISCUSSION OF OPTIONS FOR SITE REMEDIATION

As described in the preceding section, the project site does contain levels of arsenic and mercury within site soils in excess of USEPA and TAG criteria. However, these pollutants are apparently bound into the soil matrices and can only be released to the environment in relatively minor concentrations. Therefore, in-situ soils can be considered to be relatively inert and any disturbances due to site development should pose no threat to the environment.

*if you
disturb
you mobilize
chemicals*

Although only a portion of the project site falls within the jurisdiction of the NJDEP Waterfront Development Permit Regulations, we believe the approach to on-site contamination contained in the NJDEP regulations is appropriate to the development of the project site. In the review of on-site contamination, NJDEP applies its Special Hazard Areas policy (N.J.A.C. 7:7E-3.39). Special Hazard Areas are defined as those areas with a known actual or potential hazard to the public health, safety and welfare, including where hazardous materials are used or disposed. Development within Special Hazard Areas must include mitigating measures to protect the public health and safety.

In the implementation of the Special Hazard Areas policy, the focus is on the protection of public health by preventing contact with contamination. Remediation, in many cases, does not mean removal and off-site disposal of contaminated materials above assigned cleanup levels. Instead, contamination resulting from regional or "background" pollutants, is often allowed to remain on site, as long as it is not disturbed and any human contact is prevented. Concentrations above the "background" pollution are viewed as "hot-spots" and capping with clean fill is required over undisturbed areas of a site. Where excavations or disturbances occur in "hot-spots", excavated materials must be removed and properly disposed off-site.

If the NJDEP's policy is applied to the C&F Realty Site, site excavations will require the off-site disposal of excavated materials.

However, buildings will cover a large portion of the project, preventing any direct human contact with on-site contamination. The remainder of the project site will be used as landscaping, parking and access improvements, requiring a capping with clean fill.

While the focus in the development areas of the project site is on the prevention of human contact, a remediation plan for the mitigation sites has a different focus. Human contact is not a factor, since a mitigation site is deliberately designed to exclude human contact. Important elements of the mitigation sites are the excavation, rehandling and grading of the in-situ soils, planting of select species of vegetation and the management and control of site hydrology. A remediation plan must, therefore, focus on the means of preventing adverse impacts to these important elements.

*What is a
mitigation site?*

Leachate results of soil samples within the mitigation sites generally indicate that excavation, rehandling and grading of in-situ soils can be safely accomplished. Likewise, the contact between excavation and the proposed ponded areas can also occur without causing mercury or arsenic contamination of the ponded areas. Additionally, HMDC studies of the mercury contamination of Berry's Creek show that only extraordinary circumstances, such as a major dredging project in Berry's Creek, could cause a resuspension of mercury contamination into the water column, where it might be able to move into one of the mitigation sites. Thus, we find that remediation for the excavations of site soils and the control of hydrology is not required.

Studies of the bulk concentrations of arsenic and mercury uptake by vegetation and potential wildlife species appear to be focus on the mobility of mercury and arsenic, as a determinant of adverse impacts. Where chemical mobility has been shown, some adverse impacts were observed. However, in situations similar to the C&F site, lack of chemical mobility has not led to adverse impacts (P. Galluzzi, HMDC, 1981). In order to prevent the potential of future chemical mobility in site soils, it is prudent to review any potential routes of contact

with vegetation or potential wildlife species. It should be noted that vegetation is growing on the project site, and had grown in other areas of the project site currently occupied by buildings.

As shown in Table 5-1, six of the ten locations within the larger mitigation site, taken at one foot below the intended final grade, evidenced bulk concentrations above the USEPA criteria of 10 mg/kg. Similarly, one of the two locations in the smaller site was in excess of 10 mg/kg. A review of the data indicated a pattern in the larger mitigation site: Exceedances occurred at depths of 3 feet or less. Sample results of the next foot, at 4 feet below grade, were below 10 mg/kg. Thus, it would appear that an additional foot of excavation at spots within the larger site should be performed to reduce concentrations below 10 mg/kg. In the smaller mitigation site, the exceedance of 10 mg/kg criteria occurred at a depth of four feet in CFT-1 while no exceedance occurred at four feet in CFT-2. The result at CFT-1 suggests a local aberration. Comparison to deeper samples taken at the five foot depth again suggests that the removal of an additional foot of excavation adjacent to CFT-1 will also be needed. Thus, remediation of the mitigation sites will require spot excavations of an additional foot below the depths of bulk sample sites.

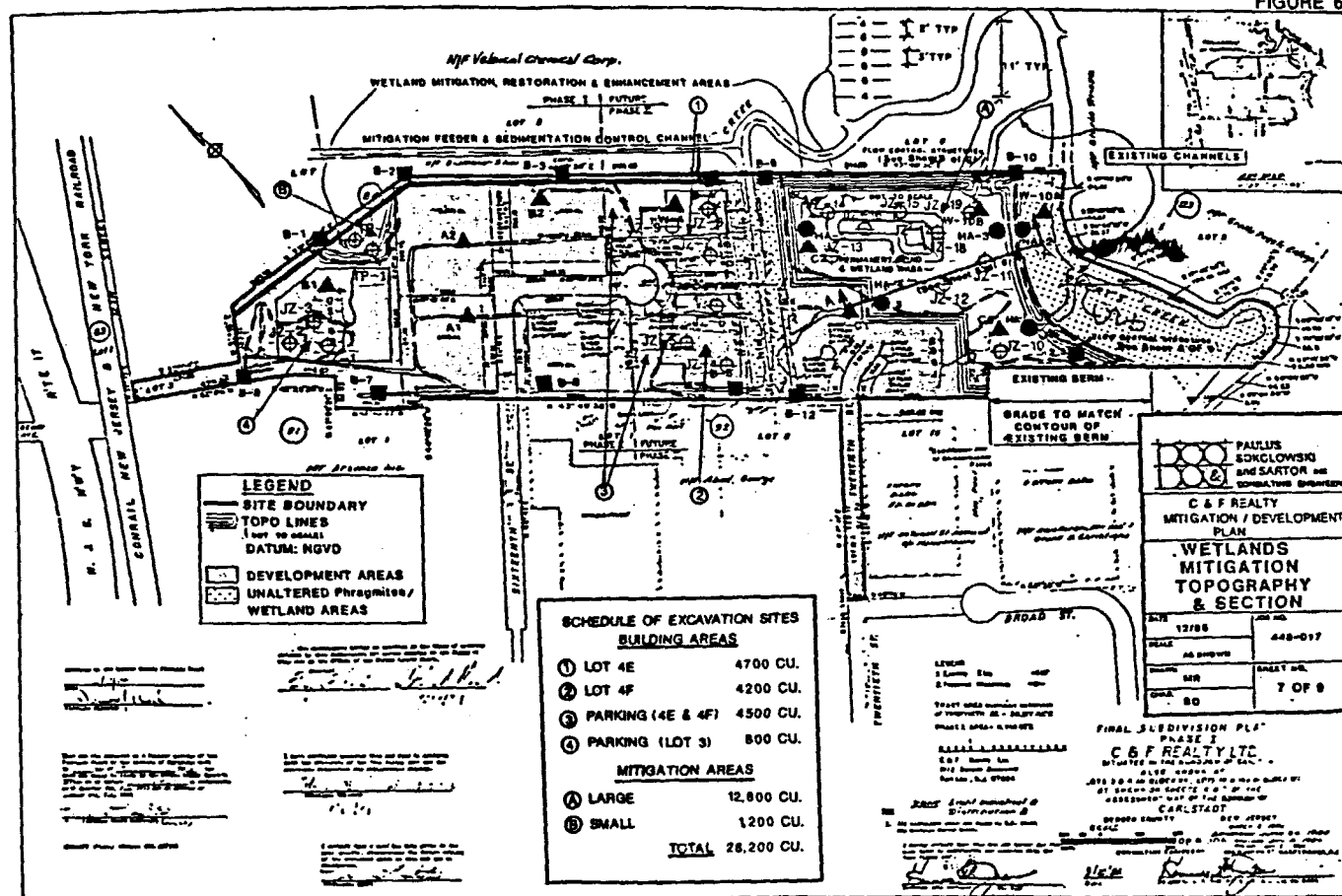
Spot excavations within the two mitigation areas will result in the need to rehandle additional soil materials since they will be treated as contaminated materials, requiring off-site disposal. Spot excavations will also result in lowered grades within the mitigation areas. To maintain the grades set for mitigation purposes, additional clean fill will be required. A side benefit of this additional fill is the capping of the excavated areas.

There are two options for remediation of contamination at the project site. In Option One, all of the contaminated soils would be excavated and properly disposed off-site. Following the analysis displayed in Table 5-2, excavations, ranging between 1 and 4 feet, would be completed at various points on the project site.

Approximately 43,300 cubic yards of excavation would result if the USEPA criteria of 10 mg/kg is used. Based upon the leachate test results, it is likely that these excavated materials would be classified non-hazardous wastes and would be given permission for disposal at a local landfill.

In Option Two, selective excavations for buildings, utilities, parking and roads and the mitigation sites would be performed. In the building areas, full-depth excavations would occur and all soils with concentrations above 10 mg/kg would be removed. In parking and access areas, only a one foot removal of loose soils would be completed, followed by a capping with either a clean fill or a synthetic liner. Utility areas would be similarly treated. The 15% open space requirement of each site, required by the HMDC as landscaping, would have no excavation and would be capped with clean fill. A total of 33,200 cubic yards would result (See Figure 6 and Attachment 3). Thus, Option One would require the removal of an additional 10,000 cubic yards.

At a cost of removal and disposal of approximately \$50 per cubic yard, option one would cost an additional \$500,000. Further, Option One would result in the need to dispose an additional 800 truckloads at a local landfill (20 cubic yards per load). Finally, the excavated materials are likely to be "wet", requiring stockpiling before off-site disposal. An additional area of two acres would be needed to stockpile the additional volume from Option One. Thus, Option Two appears to have a clear advantage. Given the limited availability of landfill space in New Jersey, Option Two is also preferable from a public policy standpoint.



LEGEND

- APPROXIMATE LOCATION OF WEHRAN ENGINEERING BORINGS
- ▲** APPROXIMATE LOCATION OF PS&S BORINGS
- ADDITIONAL PS&S BORING/ SAMPLING LOCATIONS

FOR BULK/DRY - WEIGHT ANALYSES (9/86)

JZ-0 USEPA APPROVED ADDITIONAL BORING/SAMPLING LOCATIONS FOR BULK/DRY-WT. ANALYSIS (1/87)

INOTE SAMPLES WERE REIDENTIFIED AS CF RATHER THAN JZ

BORING/SAMPLING LOCATION PLAN SUMMARY EXCAVATED SOIL VOLUMES

829730036

7.0 RECOMMENDED PLAN FOR SITE REMEDIATION

Commencing on the date that C&F Realty is authorized to proceed by the ACOE, a proposed stockpile area would be created on Lot 4H. A berm composed of excavated material would be constructed, completely encircling the lot. A synthetic-liner would then be loosely laid over the ground surface and berm, prior to the stockpiling of excavated materials. Excavated materials would be stockpiled in the lined area, as they are generated by building, utility, parking & access and mitigation site excavations. At the end of each day, the stockpile area would be covered by synthetic sheeting to prevent contact with incident rainfall. The stockpile area would also be properly secured to prevent unauthorized access.

At a height of six feet, the stockpile area on Lot 4H could contain a maximum of 33,000 cubic yards, slightly more than the Option Two excavation volume. Racking of the materials to a greater height would be precluded by site geometry and excessive drying times for the stockpiled soils. Stockpiled materials would remain in place for a minimum of 3 months. This time period would allow excavated materials to properly dry, so that can be transported to an off-site disposal site.

Concurrently with the authorization of the ACOE to proceed, PS&S will seek a waste classification letter from NJDEP for the disposal of the stockpiled materials. A waste classification letter is required before a local disposal site will permit the disposal of excavated materials. Based upon the results of the leachate testing (See Section 6.0), we anticipate that the NJDEP will classify the stockpiled materials as waste type #27, non-hazardous industrial waste, which can be disposed at a local landfill site. As we anticipate that the waste classification process could require a 3 month time period. We will begin discussions on testing and application requirements with NJDEP shortly.

Recent problems with local disposal sites could significantly impact the NJDEP's review of any request for a waste classification

letter. According to current estimates, all local landfill sites (HMDC Balefill, HMDC Landfill Site I-C and the BCUA Kingsland Landfill, located in North Arlington, N.J.) will reach their design capacity during the Summer of 1987. There are no firm plans or applications by the affected counties to replace these sites by their closing dates. NJDEP is currently examining several options, including continued use of these landfills, but it is possible that the NJDEP will redirect waste materials to other localities or states. NJDEP may decide to suspend the processing of waste classification requests, forcing C&F to continue the stockpile beyond a three month period. If this situation occurs, the area on Lot 4H has sufficient capacity, but would require a more permanent cover. The additional stockpiling time would actually provide a dryer material and improve transportability, when a disposal site becomes available.

In addition to the stockpiling operation, C&F would implement the following additional steps as a part of a remediation plan.

A common construction technique for buildings in the Hackensack Meadowlands has been the dewatering of excavation areas. Typically, water accumulates within excavations and it must be removed, so that clean controlled fills can be placed for support of building foundations. Although we expect no problems with contaminants in the water removed, as a result of the soil leachate tests herein (see Section 5.0), C&F will use a "shot-rock" fill, to significantly reduce the need for dewatering. "Shot-rock" fill is an open-graded fill composed of small to medium-sized rock fragments and it can be placed directly into an undewatered excavation. C&F also proposes the routine testing of any liquids removed by dewatering and, depending on their quality, will seek any appropriate State permits for their discharge.

In order to minimize exposures to excavations, backfilling would begin as soon as possible. Where excavations must remain open for extended time periods, temporary covering with synthetic sheeting

*Meaning
so it will get wet
+ possibly get
remediated*

*it will be too late
by the time you
start digging*

*but not
planned*

would be used. Parking areas and utility cuts will be capped after backfilling with a minimum of two feet of clean, compacted fill. Consideration will also be given to the use of geomembranes as an alternative to compacted fill. Landscaping areas, where no excavations occur, will be capped by a minimum of two feet of clean, compacted fill. Consideration will be given to the use of a geotextile fabric, placed directly on existing grades in parking areas and access road, for the reduction or elimination of excavations.

Within the mitigation areas, excavations will begin only after a silt curtain or silt fence has been installed, so as to prevent silt discharges to Berry's and Never Touch Creek. Construction will be staged to work in "dry" conditions as much as possible. At the larger mitigation site, the perimeter berm will be constructed from clean fill, obtained from off-site sources. Spillways will not be constructed until a substantial portion of the excavation within the larger site has been completed. Similarly, mitigation feeder channels will not be constructed until excavation is completed within the smaller site. Liquids removed by dewatering, as required, will be routinely tested and depending on the quality, C&F will seek any appropriate State discharge permits.

Spot excavations within both of the mitigation sites will be used to obtain exposed surfaces with bulk concentrations of arsenic and mercury below 10 mg/kg. Where spot excavations are carried below proposed final grades, approximately 1 foot of clean fill, obtained from off-site sources, will be used to refill and cap these areas.

Fill materials used for the berm and in the capping of spot excavations within the mitigation sites will be routinely tested for arsenic and mercury contamination, to insure that additional site contamination does not occur. Any fill materials, with test results above 10 mg/kg or the USEPA leachate limits (40 CFR Part 261.24), will not be used on site.

In summary, C&F proposed to properly and carefully control the process of excavation and handling of site soils thru a remediation

plan. The results of this plan will be the prevention of human contact with contamination and the prevention of adverse impacts to the implementation of the proposed mitigation plan.

QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

The following Quality Assurance/Quality Control (QA/QC) program has been designed for the field activities portion of the Plan. The procedures listed below are in accordance with the protocol as outlined in the NJDEP Field Sampling Procedures Manual (July, 1986).

Field Sampling Decontamination Procedure

Prior to the commencement of field activities and in between sampling intervals, the hand auger sampling device would be decontaminated according to the standard decontamination procedure as follows:

1. Nonphosphate detergent.
2. Tap water rinse.
3. Distilled/deionized water rinse.
4. 10% nitric acid rinse.
5. Distilled/deionized water rinse.
6. Acetone (pesticide grade) rinse.
7. Total air dry or nitrogen blow out.
8. Distilled/deionized water rinse.

In addition to the decontamination procedure described above, certain other measures would be taken to prevent cross-contamination of the samples. During the field activities, protective coveralls and disposable gloves would be worn. The gloves would be discarded following the acquisition of each soil sample to discourage cross-contamination between sampling intervals.

Trip Blanks/Travel Blanks

The purpose of a trip blank is to place control on sample handling, transport, and storage. It is used to give an indication of any contamination that may have occurred in transit to or during storage in the laboratory.



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The trip blank consists of a set of sample containers filled with laboratory demonstrated analyte-free water which is analyzed in the same manner as the samples acquired during a specific day of sampling. The sample containers themselves are not opened in the field. Rather, they just travel with the actual field samples.

Trip blanks would accompany samples at a rate of one per day. These trip blanks would be provided by USTC and would be analyzed for mercury and arsenic.

Field Blanks/Rinse Blanks

The purpose of a field blank is to place control on the sample collection process, sampling equipment and container decontamination procedures, and the ambient sampling atmosphere.

The field blank consists of two sets of laboratory cleaned sample containers. One set of containers is empty and will serve as the sample containers that will be analyzed by the laboratory. The second set of containers will be filled at the laboratory with laboratory demonstrated analyte-free water. At the field location, in the most contaminated area, this analyte-free water will be passed through decontaminated sampling equipment (hand auger) and placed in the empty set of containers for analysis.

Field blanks would be performed at a rate of one per day per sample matrix. The field blanks generated during the field activities would be analyzed for mercury and arsenic.



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Duplicate Samples

Duplicate samples would be collected at a minimum rate of five percent of the total number of samples collected. If less than 20 samples are collected in one sampling episode (one day of sampling), then a minimum of one duplicate would be obtained. Duplicate samples would also be analyzed for mercury and arsenic.

Laboratory Procedures

All analytical testing performed by USTC would be in accordance with the most recent version of the USEPA-CLP methods.



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CHAIN OF CUSTODY FORM

ATTACHMENT 2

[illegible]

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ATTACHMENT 3

VOLUME OF EXCAVATED MATERIALS FROM OPTION TWO

Land Available for Development¹:

Lots 3 (3.955 ac); 4A (1.583 ac); 4C (1.446 ac); 4E (2.503 ac); and
4F (2.377 ac)

Land within Mitigation Areas

Lots 3 (part), 4G, 4H (part), 4I, and 4J

I. Excavation from Building Sites

<u>Lot 4E</u>	$74,300 \text{ sf}^2 \times .50^3 \times 3.4 \text{ ft}^4 \times \frac{1 \text{ cy}}{27\text{cf}}$	= 4700 cy
<u>Lot 4F</u>	$67,700 \text{ sf}^2 \times .50^3 \times 3.3 \text{ ft}^5 \times \frac{1 \text{ cy}}{27\text{cf}}$	= 4200 cy
<u>Parking, etc. (4E & 4F)</u>	$120,000 \text{ sf}^6 \times 1\text{ft} \times \frac{1 \text{ cy}}{27\text{cf}}$	= 4500 cy
<u>Parking, etc. (Lot 3)</u>	$21,165^6 \text{ sf} \times 1\text{ft} \times \frac{1 \text{ cy}}{27\text{cf}}$	= 800 cy
<u>BUILDING EXCAVATION TOTAL</u>		= <u>14,200 cy</u>

II. Excavation from Mitigation Areas

Large Site (Lots 4G, 4H, 4I, and 4J)

	$214,600^{2,8} \text{ sf} \times 2.2 \text{ ft}^7 \times \frac{1 \text{ cy}}{27\text{cf}}$	= 17,500 cy
<u>Small Site</u> (Lot 3)	$13,200^2 \text{ sf} \times 3.0 \text{ ft}^7 \times \frac{1 \text{ cy}}{27\text{cf}}$	= 1,500 cy
<u>MITIGATION EXCAVATION TOTAL</u>		= <u>19,000 cy</u>
<u>GRAND TOTAL</u>		= <u>33,200 cy</u>

NOTES

1. Of the land available for site development, soil contamination excavations will only occur in the existing unfilled areas of Lots 3, 4E and 4F.
2. Unfilled area.
3. The HMDC Zoning Regulations will permit 50% building coverage of a lot.
4. Weighted average of contamination depths associated with sample sites CF-6, CF-7, and CF-8.
5. Weighted average of contamination depths associated with sample sites CF-4, CF-5 and CF-6.
6. The result of a 15% deduction for landscaped areas, which are not excavated.
7. Weighted average excavation depth, estimated from Job & Job Final Subdivision Plat, dated 2/25/85. Also includes one foot additional excavation near sample sites CF-10, CF-11, CF-12, CF-15, CF-17 and CF-19.
8. Weighted average excavation depth. Also includes one foot additional excavation near sample site CFT-1.
9. Also includes deduction for a perimeter bermed area where no excavation will be performed.